

HELLENISTIC AND BYZANTINE OPHTHALMOLOGY: TRACHOMA AND SEQUELAE

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As a case study in the transmission and elaboration of a medical idea through Hellenistic, Byzantine, and Islamic cultures, I have chosen to trace the diagnosis and treatment of three ocular conditions. These three are trachoma, trachomatous pannus, and pterygium. The latter two were viewed by medieval physicians as sequelae of trachoma.¹ These three conditions were selected because trachoma was, and still is, a major cause of blindness in the Near East, and indeed in the early centuries of our era it must have been much more common in southern Europe than one would suppose from its incidence there today. The treatment of these diseases involved both drug and surgical therapy—thus allowing a variety of techniques and terminology to be developed and expanded by subsequent medical writers. In addition, the affliction called today trachomatous pannus and the surgical treatment of it were well described very early in the Islamic literature, yet whether or not it was recognized in the Byzantine literature and earlier Greco-Roman writings is problematic. More, however, will be said on that shortly.

The present paper is concerned with the Byzantine medical literature, and the Hellenistic writings on which it was primarily based, with the pur-

pose of surveying the identification and description of these conditions along with the surgical therapies. A separate study will examine and compare in detail the compound drug remedies for these conditions, again with a view to tracing the transmission of such recipes and the maintenance of the integrity of the more frequently cited compound drugs. Future studies will be concerned with the reception of the Greek descriptions and practices in the Islamic world and the elaboration of the ideas and techniques by subsequent writers.²

A brief word is necessary here concerning the conditions themselves. Trachoma (from τραχώμα 'roughness') was considered by early Byzantine and later Islamic physicians to consist of four stages and to be a disease of the eyelid.³ Today it is viewed as a disease of the conjunctiva in which dense, hard-packed papillae form on the inner surface of the eyelid, resulting when untreated in several complications and sequelae. The condition known today as pterygium (from πτερύγιον 'wing') is a triangular-shaped ingrowth of the conjunctiva onto either side of the cornea, most frequently on the nasal side. It was early classified as a disease of the conjunctiva and removed surgically. Pannus is an invasion of the cornea by vessels from the limbus; occasionally the entire cornea becomes vascularized and the overlying corneal epithelium becomes irregular and shows small punctate ulcers.⁴ It was

[The reader is referred to the list of abbreviations at the end of the volume.]

¹At least by the tenth century A.D. pannus was recognized as being a characteristic companion of trachoma. Later Islamic physicians considered pterygium to be related to, and a form of, pannus and hence also a sequela of trachoma. Byzantine physicians did not ever spell out a direct relationship between trachoma and pterygium, although they used much the same drug therapy for both conditions. Today no direct relation between trachomatous pannus and pterygium is recognized. Islamic physicians also recognized trichiasis and entropion (ingrown eyelashes and rolled-in eyelids) as sequelae of trachoma, but for this survey only trachoma, trachomatous pannus, and pterygium are to be dealt with.

²For a thirteenth-century Islamic analysis and treatment of these three conditions see Emilie Savage-Smith, "Ibn al-Nafis's *Perfected Book on Ophthalmology* and His Treatment of Trachoma and Its Sequelae," *JHAS*, 4 (1980), 147–206; and *id.*, "Drug Therapy in Trachoma and its Sequelae as Presented by Ibn al-Nafis," *PH*, 14 (1972), 95–110.

³See M. Meyerhof, "The History of Trachoma Treatment in Antiquity and During the Arabic Middle Ages," *Bulletin de la Société d'Ophtalmologie d'Égypte*, 29 (1936), 25–87; and Hirschberg, *Geschichte*, 130–39.

⁴For all three conditions see P. D. Trevor-Roper, *The Eye and Its Disorders* (Oxford/London, 1974), 404–10 and 461.

classified by medieval Islamic physicians as a disease of the conjunctiva. It is, however, a puzzle for historians to what extent, if at all, this condition was recognized by Hellenistic or Byzantine physicians.

The first definite description we have of pannus is by the ninth-century Islamic physician Yūḥanna ibn Māsawayh.⁵ By the tenth century, Islamic physicians knew it to be always associated with trachoma and advocated removing it surgically by a procedure known later in the West as peritomy. Certainly no such surgical procedure is mentioned in the extant Hellenistic and Byzantine sources surveyed here. The usual Arabic name for it is *sabal*, meaning rain, although Ibn Māsawayh also used the Arabic *riḥ al-sabal* and the Persian *bārandagī*, both of which mean “the pouring of rain.” However, the ninth-century oculist and translator Ḥunayn ibn Isḥāq stated that there was a Greek name for this condition.⁶ Ḥunayn wrote the word as *qīr-sūfthālmīyā* which suggests a Greek word from *κρσός*, meaning an enlargement of a bloodvessel, and *ὀφθαλμία*, a disease of the eye. The ninth- and early tenth-century physician Abū Bakr Muḥammad ibn Zakarīyā’ al-Rāzī (Rhazes), citing Ḥunayn as a source, stated that the Greek name is derived from the word *al-dawālī*, apparently trying to define the transliterated Greek word given by Ḥunayn:⁷

Ḥunayn said: *al-sabal* is vessels filled with blood and thickened and swollen, and there is with it in most cases watering of the eyes and lacrimation, itching, and redness, and its name in Greek is derived from the name *al-dawālī*.

The Arabic word *al-dawālī* is an early technical medical term for varicosity.⁸

While the term *κρσσοφθαλμία* would fit well the vascularization of the cornea which is the hallmark

of pannus, it is unfortunately not known to occur in any extant Greek medical writing. Nor could I locate a passage in any known Hellenistic or Byzantine tract which describes a condition which could be interpreted as pannus.

Nonetheless, al-Rāzī⁹ in his extensive book on eye diseases, which formed part of his *Kitāb al-Ḥāwī fī al-ṭibb*, appears to have felt that some Greek writers did in fact describe a condition which he termed *al-sabal*, or pannus, for he cites three such passages. In all three cases only the title of the work is given (in Arabic), and the author’s name omitted; the titles, however, of the Hippocratic and Galenic writings are quite uniform in the Arabic literature. One passage given by al-Rāzī is from Galen’s *De usu partium*.¹⁰

In the tenth [book] of *On the Uses of the Parts* (*Manāfi’ al-a‘dā’*) he said that *sabal* (pannus) is a wasting (*nuqsān*) occurring in the pupil, and because of that the body of the eye is weakened and becomes small, and in most cases it occurs in one eye [only]. The recognition of it is easy because the healthy eye reveals the diseased one.

When we turn to the corresponding portion of *De usu partium* we find a discussion of the wrinkling and atrophy of the eye in a context not of eye afflictions but a discourse on the nature of the aqueous humor. The Greek text reads as follows:¹¹

Thus the wrinkled condition of the hornlike tunic itself in old persons is proper to old age because of weakness and the lack of pneuma coming down from above. The affection called *phthisis* is a shrinking of the pupil itself without any separate involvement of the hornlike tunic. Hence in most cases it occurs in [only] one of the eyes so that it is readily recognized and does not escape the notice of any physician; for the healthy eye beside it indicates the failure of the one affected.

Since contraction and atrophy of the cornea or pupil are not among the hallmarks of pannus, we are at first puzzled by al-Rāzī’s misinterpretation of the atrophy of the eye for pannus—until, that is, we look at the Arabic translation that Ḥunayn ibn Isḥāq prepared of *De usu partium*. There we find the following rendering of the same passage:¹²

⁹For the writings of al-Rāzī see Ullmann, *Medizin*, 128–36.

¹⁰Al-Rāzī, *Kitāb al-Ḥāwī* (n. 7 above), 119 (jūz 2, bāb 3).

¹¹Galen, *De usu partium* (ed. Helmreich), II, 73; Galen, *Parts* (trans. May), II, 477. The translation is that of May.

¹²The tenth chapter of the Arabic version has not been edited. The passage here translated is to be found in the following two MSS: Escorial, Bibliotheca del Monasterio de San Lorenzo el Real de El Escorial, Arabic MS 850, fol. 118a; and Paris, Bib-

⁵M. Meyerhof, “Neues zur Geschichte des Begriffes Pannus,” *SA*, 19 (1927), 240–52. For Ibn Māsawayh, see Ullmann, *Medizin*, 112 and 205; and Sezgin, *Geschichte*, III, 231–36.

⁶Ḥunayn ibn Isḥāq, *The Book of the Ten Treatises on the Eye Ascribed to Ḥunayn ibn Isḥāq (809–877 A.D.). The Earliest Existing Systematic Textbook of Ophthalmology*, ed. and trans. M. Meyerhof (Cairo, 1928), 57.

⁷Al-Rāzī, Abū Bakr Muḥammad ibn Zakarīyā’, *Kitāb al-Ḥāwī fī al-ṭibb*. Rhazes’ *Liber Continens. An Encyclopedia of Medicine. Part II. On the Diseases of the Eye. Edited by the Bureau, based on a unique Escorial MS.* (Hyderabad, 1374/1955), 145. See also M. Meyerhof, “Nachträge zur Geschichte des Begriffes Pannus,” *SA*, 20 (1928), 391.

⁸For examples of its use see P. de Koning, *Trois traités d’anatomie arabes par Muḥammad ibn Zakarīyya al-Rāzī, ‘Alī ibn al-‘Abbās et ‘Alī ibn Sīnā* (Leiden, 1903), 817.

And the wrinkling (*shanaḡ*) of the cornea occurs in old men because of the weakness of the tunic itself which occurs in old age¹³ from their age and because of the smaller amount of pneuma which comes to the eye. As for the disease which occurs in the eye and is called *al-sill* (wasting away), it is a wasting (*nuḡṣān*) of the eye itself in that it exists when the pupil alone diminishes in size without there being any of the symptoms in the cornea itself. For this reason it occurs in most cases in one eye only, and the recognition of it is easy and is not hidden from even one of the physicians, for the healthy eye discloses the diseased eye and reveals it.

As can be seen, Ḥunayn translated the Greek term φθίσις, meaning wasting away or atrophy, with the Arabic word *sill*, which means basically the same thing and is a standard rendering of *phthisis*.¹⁴ Al-Rāzī, however, did not apparently recognize the word, and hence interpreted *al-sill* as *al-sabal*, which in Arabic involves only a slight change in the formation of the word. Thus al-Rāzī incorrectly extracted and summarized this passage as an example of Galen's knowledge of pannus.

A similar mistake in interpreting the Arabic may well have accounted for al-Rāzī's extracting another statement concerning the atrophy of the eye and asserting that it was about pannus. Al-Rāzī refers to Galen's tract *Methodus medendi* when saying:¹⁵

The third [book] of *Ḥilāt al-burʿ*: he said *al-sabal* (pannus) happens to the eye when its nourishment and its humor are diminished, so it [the eye] is diminished and lessened.

Although I have been unable to locate the equivalent passage in *Methodus medendi* and have not seen the Arabic version, it is likely that a mistake similar to that just illustrated resulted in this inclusion of a statement which in fact applies not at all to trachomatous pannus. Consequently neither of these citations supports the notion that pannus was described by Galen.

The third passage is more puzzling. In citing a treatise entitled *Kitāb taqdimat al-maʿrifa*, which is

the usual Arabic title of the Hippocratic treatise *Prognostic* (Προγνωστικόν),¹⁶ al-Rāzī says:¹⁷

Concerning *al-sabal*: He said in *Kitāb taqdimat al-maʿrifa* in the first section (*maqāla*) that indeed it is possible for the vessels in the eye to become red so that the eye appears red, indicating repletion (*imtilāʿ*) in the brain and its "mater"; and as for the acrid swelling there, when it is in that state it is fitting for the pannus (*al-sabal*) that the brain be purged and strengthened with strong substances and abstention from whatever irrevocably fills it.

And after this he said that it connected with the conjunctiva by the vessels in it, and on account of these there is no [effective] care inside or outside, for anointing is without good effect.

In the Hippocratic text *Prognostic*¹⁸ there is no such passage, but only a brief reference, in part two and not part one, to some ocular ailments to be noted by physicians:¹⁹

For if they shun the light, or weep involuntarily, or are distorted, or if one becomes less than the other, if the whites be red or livid or have black veins in them . . . all these symptoms must be considered bad.

This passage certainly does not merit the rendering of it presented by al-Rāzī, if indeed this is the passage he had in mind. It is possible that al-Rāzī was actually using the commentary by Galen on the Hippocratic text *Prognostic*, for Galen in the first book of his commentary says, regarding the passage just cited:²⁰

The whites of the eyes becoming red, such as in ophthalmias and in some people who are intoxicated, is an indication of repletion (πλήθος) in the brain and membranes (μήνιγγας, dura and pia mater), and indeed sometimes inflammation has occurred in them. Either way, the blood is forced to the veins of the eyes, for which reason the white part in them appears red—that is, the area all around what is called the "ring" (the limbus, στεφάνη) which we have learnt through dissections to be a point of union of all the membranes and tunics of the eye.

¹⁶ Ullmann, *Medizin*, 29. The citation occurs in the midst of citations from Galenic works, which supports the interpretation given below that al-Rāzī was actually using the commentary by Galen on the Hippocratic treatise *Prognostic*.

¹⁷ Al-Rāzī, *Kitāb al-Ḥawī* (n. 7 above), 118–19 (jūz 3, bāb 3).

¹⁸ Littré, II, 140–90; *Hippocrates* (ed. and trans. Jones and Withington), II, 1–55.

¹⁹ *Hippocrates* (ed. and trans. Jones and Withington), II, 10–11.

²⁰ Galen, *In Hippocratis prognosticum commentaria tria* I, 10, ed. J. Heig (CMG V, 9, 2) (Berlin, 1915), 222. I wish to thank Professor John Duffy for bringing to my attention the tendency of medieval Islamic authors to confuse the Galenic commentaries with the Hippocratic treatises themselves.

liothèque Nationale, arabe MS 2853, fol. 175b. For a general discussion of the nature of Ḥunayn's translation and an edition of the sixteenth book, see E. Savage-Smith, "Galen on Nerves, Veins, and Arteries: A Critical Edition and Translation from the Arabic, with Notes, Glossary and an Introductory Essay" (Dissertation, University of Wisconsin, 1969).

¹³ *shaykhūkha* in Escorial, Arabic MS 850, fol. 118a; and *shu-yūkh* "old men" in Paris, arabe MS 2853, fol. 175b. Cf. Galen, *Parts* (trans. May), II, 477, note 29.

¹⁴ See, for example, E. W. Lane, *An Arabic-English Lexicon*, part 4, (London, 1872; rpr. Beirut, 1968), 1396.

¹⁵ Al-Rāzī, *Kitāb al-Ḥawī* (n. 7 above), 117 (jūz 2, bāb 3).

If this was the passage which al-Rāzī had before him when preparing his collection of abstracts, then he took the first sentence of Galen's commentary, inserted an idea of his own in which he mentions pannus, and then in rendering Galen's second sentence misinterpreted it. In any case, neither Galen nor al-Rāzī refer to the cornea being red and engorged, which is the characteristic of pannus. If it is assumed that the text which al-Rāzī was referring to is now lost or unidentified, this third passage from al-Rāzī still cannot be used as conclusive evidence for early knowledge of pannus, since, as we observed above, al-Rāzī had earlier used the term when the original did not warrant it.

For these reasons we cannot rely upon the citations given by al-Rāzī as proof that trachomatous pannus was recognized in the Hellenistic literature. It has been brought to my attention that Galen, in his treatise *On Examining Physicians*, may refer to pannus. This treatise is lost in the original Greek; the Arabic translation is currently being edited, but until it is published no definite conclusions can be drawn regarding Galen's knowledge of the condition.²¹

We are then left with the statement by Ḥunayn ibn Ishāq that there did exist a Greek word for the condition. But since neither the word, nor a similar word, nor a description in general terms of this ailment, can be found in the Hellenistic and Byzantine writings themselves, it is still an unsettled question. What can be said with certainty, however, is that it was not widely recognized in Byzantine practice, for it occurs in none of the treatises to be discussed shortly. For this reason little reference will be made to pannus in what follows. It is to be

²¹I wish to thank Dr. Vivian Nutton for drawing this to my attention. The editor of the Arabic text, A. Z. Iskandar, published a few paragraphs of this Galenic tract in English translation (giving no Arabic text), in one of which, according to Iskandar, Galen states "you should also praise those who treat with drugs ailments of the eyes which others treat by excision. Such ailments are e.g. pterygium, trachoma, pannus, chalazion. . . ." A passage from al-Rāzī's treatise *On Examining Physicians*, which Iskandar compares with this Galenic statement, is nearly identical except for omitting the reference to pannus. See A. Z. Iskandar, "Galen and Rhazes on Examining Physicians," *BHM*, 36 (1962), 363. Several Arabic paragraphs from Galen's treatise *On Examining Physicians* were published by A. Dietrich; in these published sections there is no mention of pannus, although there is a list of diseases treated by surgery which includes cataract, pterygium, and trichiasis (but omits pannus). See A. Dietrich, *Medicinalia Arabica. Studien über arabische medizinische Handschriften in türkischen und syrischen Bibliotheken* (Göttingen, 1966), 190–95. When the complete Arabic text is available more can be said regarding Galen's knowledge of pannus.

understood that it is not found in any Greco-Roman or Byzantine writing which has been examined.²²

In the collection of Hippocratic writings there are no references to what might be considered trachoma,²³ although there is a brief reference to a sequela of trachoma, trichiasis, in a late appendix to the important Hippocratic treatise *Regimen in Acute Diseases*.²⁴ It is only in another late Hippocratic tract, *On Vision*,²⁵ that we encounter what must be a treatment for trachoma, although no name or detailed description is given for the condition:

When you scrape the eyelids you must scrape with pure and thick Milesian wool rolled around a wooden rod. Be mindful of the limbus [and cornea] and do not cauterize through to the cartilage (χόνδρος). The indication of when you are to stop scraping is when there is no longer pure blood, but a blood-colored or watery liquid. After this it is necessary to rub on one of the liquid drugs, such as that from ἄνθος χαλκοῦ ("flower of copper," fine granulated copper). Afterwards, following the scraping and cauterizing,²⁶ when the scabs (ἐσχάραι) have fallen off and the ulcers are cleansed and producing flesh, it is necessary to incise the parietal bones. When the blood streams forth, one must treat with a drug for staunching blood. After that, cleanse the head.

²²The fact that there is no conclusive evidence at this point that Galen recognized pannus is one reason for supposing that the treatise extant in Arabic under the title *Jawāmi' Kitāb Jālīnūs fī al-amrād al-ḥāditha al-ʿain* ("Summary of Galen's Book on the Diseases of the Eye") is in fact based upon spurious Galenic writings, for this treatise discusses *al-sabal*. I am in the process of editing and translating this treatise and shall include a discussion of it in a future study on the Islamic knowledge of Greek sources. For manuscript copies of this tract see Ullmann, *Medizin*, 56, and Sezgin, *Geschichte*, III, 101–102.

²³In the Hippocratic tract *Epidemics III* there is a reference to "growths on the eyelids, internal and external, in many cases harming the sight, which are called σῶκα (figs)." See Hippocrates, (ed. Littré), III, 84–85. This passage is not specific enough to warrant the interpretation of it as a description of trachoma; it is likely only a reference to styes or possibly warts on the eyelids, even though the author does speak of "figs" and the papillary stage of trachoma was later called σῶκωσις. See J. T. Pearlmann, "Hippocrates and Ophthalmology," *American Journal of Ophthalmology*, 68:6 (1969), 1072, who considers it a description of trachoma.

²⁴Hippocrates, *Du régime des maladies aiguës, Appendice*, ed. and trans. R. Joly (Hippocrate, VI, 2) (Paris, 1972), 95–96; Hippocrates, (ed. Littré), II, 516–18; cf. III, xlv and X, xv–xvii.

²⁵Pseudo-Hippocrates, *De visu* 4, 5; Hippocrates, (ed. Littré), IX 156–9 = Joly, ed., *Hippocrate*, XIII, 169–71. See also Hirschberg, *Geschichte*, 130–31; Meyerhof (n. 3 above), 27; and A. Haras, *Die hippokratische Augenheilkunde* (Inaug. Diss. Erlangen, 1896), 14.

²⁶ξύσις and καῦσις. Cautery here seems to refer to the use of a caustic solution rather than cauterizing with heat. It may be that the author intended for the wool on the wooden rod to be soaked in a caustic, since he warns of cauterizing into the "cartilage" before he mentions using the liquid remedy. See J. Sichel, "De la vision," in Hippocrates (ed. Littré), IX, 122–61.

If the lids are more thick than normal, try to cut as much of the flesh as is easily possible on the under-side. After that cauterize the lids with [a cautery] which is not red-hot, being mindful of the nature of the hairs [lashes], or shrink it with burnt and pulverized "flower of copper." When the scab falls off, treat the rest.

The condition known today as pterygium is mentioned briefly by name (πτερύγιον) in the Hippocratic treatise *Prorrhethikon II*.²⁷ There is, however, no reference to a surgical operation to remove it nor a detailed description of it. There appear to be no further references in the Hippocratic corpus to trachoma or pterygium, nor to pannus or other sequelae.

Hellenistic physicians were clearly aware of trachoma and the scraping of the eyelids to relieve it.²⁸ Medical practice current in the first century A.D. is reflected in the encyclopedia of Celsus written between A.D. 18 and 39. In the medical portion of the Latin encyclopedia (*De medicina* VI.6.26–28) it is said that trachoma (*aspritudo*) follows inflammation (*inflammatio*) of the eyes, and that, as a result of trachoma, running eye (*lippitudo*) occurs which aggravates the trachoma. Some physicians, Celsus noted, scrape the thickened and hard (inner surface) of the eyelids with a fig leaf, or a corrugated probe (*asperato specillo*) or a scalpel, and rub medicaments daily under the eyelid. Celsus warned, however, that such scraping should only be done when there is marked and inveterate roughness, and then not very frequently. It is better to treat by diet and by proper medicaments, for which Celsus recommends exercise, frequent baths, washing the eyelids with hot water, eating food which is acrid and attenuating, the use of the compound remedy called *Caesarianum*, a collyrium named after a certain Hierax,²⁹ and those collyria called *Canopita* (from the town Canopus in Egypt), *zmilion* (from σμίλον 'the little scalpel' because it stings), *pyxinum* (kept in a box-wood case), and *sphaerion*, the last two recipes having been invented by Euelpides.³⁰ Celsus gives the recipes for the col-

lyria at various places in the writing on medicine.³¹ When none of these remedies are at hand, Celsus states (VI.6.28) that goat's bile or the best grade of honey are suitable for treating trachoma.

In the chapter on surgical procedures (VII.7.4) Celsus discusses pterygium. Throughout the descriptions of pterygium in Hellenistic, Byzantine, and Islamic literature, there is no distinction made between the two conditions which we today call true pterygium and pseudo-ptyerygium. Pseudo-ptyerygium is a fold of conjunctiva resembling a pterygium which has become secondarily adherent to marginal ulcers on the cornea, caused by burning or other injury. Pseudo-ptyerygium can be distinguished from true pterygium in that a probe can be easily passed under it, for a bridge forms over the limbus in the case of pseudo-ptyerygium. Such a distinction, however, between those pterygia which can easily have a probe passed under them and those which cannot is not remarked upon in the ancient or medieval literature.

According to Celsus (VII.7.4) *unguis*, which he notes was called in Greek *pterygion*, was "a little sinewy membrane" (*membranula nervosa*) arising from the angle of the eye [canthus], most often from the nasal side, and sometimes spreading until blocking the pupil. It was to be treated by drugs if of recent origin, but if it was thick and of long standing then it had to be excised. For this operation, the patient was to be either seated in a chair facing the physician, or turned with his back to the physician so that his head rested upon the physician's lap. Some physicians preferred the former position if the left eye was affected and the latter if the right eye was afflicted. One eyelid was opened by the physician and the other by an assistant, and a hook inserted to lift the growth while a threaded needle was passed through it. After laying aside the needle, the physician then took both ends of the thread and raised up the pterygium by means of the thread and separated it from the eyeball by using the handle of a scalpel. By then pulling and slackening the thread he determined its point of origin. Celsus then warns the surgeon:³²

There is a double danger, that either some of the pterygium is left behind and, if this ulcerates, it is hardly ever amenable to treatment; or that with it part of the

²⁷ Hippocrates, *Prorrhethics II*, 20, in Hippocrates (ed. Littré), IX, 48–49.

²⁸ See Meyerhof, "Trachoma" (n. 3 above); and Hirschberg, *Geschichte*, 132–35.

²⁹ Nothing is known of where or when Hierax lived. See H. Gosson, "Hierax (12)," *RE*, VIII (Stuttgart, 1913), col. 1411. The statement of Celsus, "*id quod Hieracis nominatur*," is better interpreted as a proper name than from the Greek ἱέραξ 'falcon' as Hirschberg preferred; see Hirschberg, *Geschichte*, 263.

³⁰ The last two collyria, *pyxinum* and *sphaerion*, also appear as names of collyria engraved on extant Roman collyria seals. See H. Nielsen, *Ancient Ophthalmological Agents* (Acta Historica

Scientiarum Naturalium et Medicinalium, 31) (Odense, 1974), 22–23.

³¹ Celsus (ed. and trans. Spencer), II, 214–7, 211 and 213.

³² Celsus, *De medicina* VII, 7.4 (ed. and trans. Spencer, III, 331). Translation is that of W. G. Spencer.

flesh is cut away from the angle; and if the pterygium is pulled too strongly, the flesh follows unnoticed, and when it is cut away a hole is left through which there is afterwards a persistent flow of rheum; the Greeks call it *rhyas* (ῥύας).

Once the true point of origin at the canthus is observed, then the pterygium was cut with a knife so that no part of the canthus was hurt; Celsus does not mention procedures for excision near the cornea. Afterwards, flax (*linamentum*) soaked in honey was put on the eye with a linen cloth (*lintheolum*) over it and either a sponge (*spongia*) or unscoured wool (*lana sucida*) on top of that. The eyes were to be opened daily to prevent adhesion and then anointed with a collyrium which would cicatrize the ulcers. The procedure should ideally be carried out in the spring and certainly before winter. Celsus adds that lesions (*vitia*) can arise when treating pterygium as well as from other causes, and sometimes when not all the pterygium has been cut away, a small tumor arises in the corner of the eye.³³

The encyclopedia of Celsus is important for our knowledge of early Roman practices, although his treatise had little direct influence on later Hellenistic and Byzantine physicians and was unknown in the Islamic world. Nonetheless, many items which occur in later works first appear in the account of Celsus, and must reflect practices current in his day which were transmitted to later writers by sources now unknown.

The Roman physician Scribonius Largus, a younger contemporary of Celsus, included in his *Compositiones*, also written in Latin, six compound remedies for trachoma, including one called *hygra* because it is a liquid (ὑγρόν) to be used against "very long-standing roughness of the lids and granular flesh which is called σύκωσις."³⁴ The latter term, which Scribonius gives in the Greek, means "fig-like," and is a reference to the papillary stage of trachoma, resembling the inner surface of a ripe fig.³⁵

³³ Celsus, *De medicina* VII, 7.4 (ed. and trans. Spencer, III, 328–33); cf. Hirschberg, *Geschichte*, 271–73.

³⁴ Scribonius Largus 37 (ed. Helmreich, p. 18; ed. Sconocchia, p. 27). Helmreich retains the Greek (inserted by Jean Ruelle in his edition of Largus [Paris, 1529]), but Sconocchia has restored the Latin on the basis of fresh MS readings. See F. Rinne, "Das Rezeptbuch des Scribonius Largus," *Koberts historische Studien aus dem pharmakologischen Institut der kaiserlichen Universität Dorpat*, 5 (1896), 1–99 [p. 14]; and W. Schonack, *Die Rezepte des Scribonius Largus* (Jena, 1913), 22–23, no. 37. See also Meyerhof, "Trachoma" (n. 3 above), 29; Hirschberg, 297, no. 37; and Nielsen, *Ancient Ophthalmological Agents* (n. 30 above), 26.

³⁵ For a modern discussion of the four stages of trachoma, see Trevor-Roper, *The Eye* (n. 4 above), 404–10.

After giving directions on how to compound this collyrium, Scribonius goes on to say that the eyelid should be everted and the remedy carefully rubbed in until lacrimation ceases (*delacrimatio*). When the stinging stops, the lid is again everted and the membranes (*membranae*, eschar caused by the caustic substances) are removed with the thumb from the inner surface of the lid, which, he adds, is easily done. After this the lids are to be anointed with a thick ash-colored collyrium diluted in water. The procedure, Scribonius continues, "removes in a few days the chronic roughness (*callos*) and trachoma (*aspritudines palpebrarum*) even in cases which were given up by oculists (*oculariorum*)." Scribonius gives five other recipes for trachoma, in addition to the ash-colored ones;³⁶ there is no mention of pterygium, however.

Yet another near contemporary of Celsus, who wrote, however, in Greek rather than Latin, was the army physician Dioscorides, born in Anazarbus, near Tarsus in Cilicia, on the southern coast of Asia Minor. His extensive treatise on *materia medica*, Περί ὕλης ἰατρικῆς, was a major source for Galen and subsequent writers when compiling compound remedies. While discussing various substances, Dioscorides recommends eight for use in trachoma (τραχέα βλέφαρα, τραχώματα ἐν ὀφθαλμοῖς, τραχύτης βλεφάρων), including items such as fig leaves and hematite.³⁷ For pterygia, three are specified, including rock salt and licorice, while for both conditions three items are advocated—aloe, iron oxide, and "bone" of cuttlefish (*sepia*) made into collyria.³⁸ The simples recommended by Dioscorides and their subsequent use will be treated in greater detail in a separate study of drug remedies. Suffice it to say at this point that he served as

³⁶ Nos. 24, 28, 32, 33, 35, and 36 of his collection of recipes (ed. Sconocchia, pp. 23, 25, 26, and 27). Schonack, *Die Rezepte* (n. 34 above), 20–23; and Hirschberg, *Geschichte*, 296–97. These included one collyrium called ἄρμα (chariot) "because it has four parts, as a chariot has four horses and has quick results," and one called *stratioticum* "soldier-like," a name which also occurs on extant Roman collyria seals; see Nielsen, *Ancient Ophthalmological Agents* (n. 30 above), 22–23.

³⁷ *De materia medica* I, 64.4 (myrrh) and 128.6 (figs); II, 5 (Pontic mussel) and 74.4 (lanolin), V, 5.2 (unripe grape juice), 78.2 (oxidized copper = "verdigris"), 99.2 (copper ore), and 126.1 (hematite); (ed. Wellmann, Vol. I, pp. 59, 119, 123, and 150; Vol. III, pp. 5, 47–48, 69–70, and 94).

³⁸ *De materia medica* I, 101.2 (acacia); III, 5.2 (licorice); V, 109.2 (salt); and II, 21 (sepia); III, 22.4 (aloe); V, 80.1 (iron oxide); (ed. Wellmann, Vol. I, p. 93; Vol. II, pp. 9–10; Vol. III, pp. 52–53. For aloe, see J. Scarborough, "Roman Pharmacy and the Eastern Drug Trade," *PH*, 24 (1982), 135–43. For sepia, see D. W. Thompson, *A Glossary of Greek Fishes* (London, 1947), 231–32.

a major figure in the development of treatment for these conditions, even though he provided no general discussion of the afflictions or their general therapy.³⁹

The second-century A.D. physician Antyllus⁴⁰ wrote a treatise on surgery, *Χειρουργούμενα*, which is lost to us today except through quotations from later writers. In the case of his surgical treatment of pterygium we have a quotation by al-Rāzī in *Kitāb al-Hāwī fī al-ṭibb*:⁴¹

Concerning the excision of pterygium, Antyllus said that what is left of it remains always. If you extirpate it in ignorance, there will also be cutting into the flesh which is in the canthus; and there will occur from that lacrimation and separation between the flesh and the pterygium. If the pterygium is white and the flesh black, and [or?] the flesh loose and the pterygium hard, then excise it. Then drop into the eye salt and cumin and dress it with egg white and oil of rose. Then after some days anoint with the Red [Collyrium].

The admonitions to physicians to avoid leaving any behind after extirpation and cutting into the flesh in the canthus were made in the first century A.D. as well, according to Celsus. On the other hand, the use of oil of rose and the Red Collyrium is typical of Arabic literature on the subject, and not encountered in the Greek. It is quite possible, in light of the liberties which al-Rāzī took in his summary of Galen quoted earlier, that these latter items were added by al-Rāzī onto his summary of Antyllus's description. However, it might be that Antyllus first prescribed such things, but they were not noted in the later Byzantine writings. Antyllus's statements concerning when to excise the pterygium are obscure as transmitted by al-Rāzī.

Galen, also writing in the second century A.D. discussed both trachoma and pterygium at various places in the large corpus of his extant writings. Of trachoma he had the following to say in *De compo-*

sitione medicamentorum secundum locos IV, 2 (Kühn XII, 709–11):

... roughnesses (αἱ τραχώτητες) of the eyelids, because of which, as in ophthalmia, the tunics of the eyes, being constantly hit, suffer pain. We venture to mix with the drugs appropriate to inflammation a small amount of the cleansing (ῥυπτικά) drugs, like the *trachomatikon* collyrium⁴² from wine, so as to stop whatever is growing upon the eyelids, and once the inflammation of the eyelids has subsided to scrape the roughness. In the case of those having ulcers along with stinging discharges, it is not possible to use these medicaments, for the "hornlike" [cornea] is then even more eroded and the prolapsis of the "grapelike" [uvea] is great, and very much pain seizes the patient, and the malignant discharge (κακὸν ῥέυμα) is brought on.

In severe cases the physicians have invented, in their perplexity, a singular cure, which is to cleanse the everted eyelids and scrape them without the use of drugs. Some scrape superficially with the spoon of the scalpel (τῷ κυανθίσκῳ τῆς σμύλης) and then with a soft sponge wipe off the discharge, using caustics on the eyelids for the remainder of the roughness, while others employ the superficially rough skin of certain marine animals (θαλαττίων ζώων) for the same purpose. One of my teachers made a collyrium from pumice (κίσσηρις) and scraped the roughness with it after everting the eyelids. Obviously it is necessary to pulverize the pumice first and then mold it with tragacanth or gum.⁴³ After the discharge has ceased through the action of the collyria, then we may venture to apply to the lids cleansing drugs, at first in a weak mixture and then gradually increasing the strength when it appears the patient can bear it. After the discharge has dried up and the eyelids are moderated, it is necessary to fill the empty ulcers (ἔλκη) with a collyrium of frankincense, mixing at first a very little bit of it with wine, and then increasing the strength of the mixture, so that the eyelids will no longer harm the tunics of the eye and the ulcers will be clean and precisely filled and cicatrized.

In another treatise, *De simplicium medicamentorum* XI, 27 (Kühn XII, 347–48) Galen described another scraper for trachoma, made from cuttlefish "bone":⁴⁴

⁴² A *trachomatikon* collyrium was any of a class of collyria designed specifically for combating roughness, cicatrices, and trachoma.

⁴³ A similar statement concerning items for scraping the "fig-like" (σύνκωσις, the papillary stage of trachoma) is found in Galen's commentary on the Hippocratic treatise *Epidemics* VI (Kühn XVII A, 901–2); Galen, *In Hippocratis epidemiarum librum VI commentaria I–VIII*, ed. E. Wenkebach and F. Pfaff (CMG V, 10, 2, 2) (Berlin, 1956), 62–63.

⁴⁴ For further discussion of the use of the bony shell embedded in the mantle of cuttlefish (genus: *sepia*), a genus of cephalopod mollusks, and related items used for scrapers in trachoma, see the separate study, forthcoming, of drug remedies employed in Hellenistic and Byzantine practice. In using cuttlefish "bone" Galen may well have been following Dioscorides.

³⁹ In Dioscorides's treatise entitled *Εὐπόροιστα* or *Περὶ ἀπλῶν φαρμάκων* I, 44.2, there occurs the statement that "callused lids" (τετυλωμένα βλέφαρα) must be everted and scraped with the rough leaves of a fig tree, or with a scalpel, or with the "bone" of cuttlefish formed into a collyrium, and also verdigris, which with gum is formed into a collyrium (ed. Wellmann, Vol. III, p. 167). Other references collected in Thompson, *Fishes* (n. 38 above), 232. For the "genuineness" of Dioscorides's *Simples*, see M. Wellmann, *Die Schrift des Dioskurides Περὶ ἀπλῶν φαρμάκων* (Berlin, 1914). For this and other writings, see J. M. Riddle, "Dioscorides," in *Catalogus* IV, 3–143; and Scarborough and Nutton, "Preface," 187–94. For the problem of Dioscorides as an "army doctor," see *ibid.*, 213–17.

⁴⁰ See M. Wellmann in *RE*, I, part 2 (Stuttgart, 1894), cols. 2644–45; Ullmann, *Medizin*, 78; Sezgin, *Geschichte*, III, 63–64; and R. L. Grant, "Antyllus and His Medical System," *BHM*, 34 (1960), 154–74.

⁴¹ Al-Rāzī, *Kitāb al-Hāwī* (n. 7 above), 150, cf. 138 (jüz 2, bāb 4).

The hard shell of cuttlefish (τὸ σπητιάς ὄστρακον) is sufficiently porous so that it is not [like] the stony shells of oysters. . . . Being suitable for roughness, we are also accustomed to use it against the severe roughnesses in the eyes which are called "fig-like" (σύκωσις, the papillary stage of trachoma), carving from it something resembling a [molded] collyrium in form and rubbing the roughnesses until they bleed. Having done this, the caustic (καθαίρετικά) collyria function better on them.

In *De compositione medicamentorum secundum locos* IV, 8, Galen specified fifteen compound remedies for trachoma,⁴⁵ all drawn from the immediate source of Asclepiades Pharmacion, who wrote about the third quarter of the first century A.D.⁴⁶ A few of the recipes bear the names of persons who possibly were their supposed inventors. There is the σκυλάκιον ("young puppy," but possibly from Scylacium in southern Italy) collyrium of Apollonius the Physician which is said to be the same as the "hawkweed" (ἰερῶκιον) *trachomatikon* collyrium which is labeled Phoenix (Φοίνιξ). Galen gives a variant recipe for the Phoenix collyrium as he found it in the collection of remedies by Areius of Tarsus,⁴⁷ and also a collyrium for trachoma by Paccius, as excerpted by Asclepiades.⁴⁸

Concerning the nature of pterygium, there is the following statement in the probably spurious Galenic tract *De remediis parabilibus* II, 4 (Kühn XIV, 410–11):

Pterygium is a sinewy (νευρώδης) projection of the conjunctival membrane beginning from the corner and

proceeding to the limbus (στεφάνη) until it increases and even covers the pupil (κόρη).⁴⁹ When large and long-lasting, surgery is indicated. Recent and moderate-sized pterygium is removed by abrasives (σημηκτικά) such as burnt copper or χαλκανθος (an impure sulfate of copper), with gall of swine. Another very efficacious [medicament] is one part χαλκανθος and one part gum arabic. Another is lycium and henna with water.

Here, as earlier in Celsus, the wing-shaped ingrowth of the conjunctiva forming pterygium is described as "sinewy." It is probable that Hellenistic physicians intended this adjective to mean "fibrous" in this context. This particular definition, given in what is likely a spurious Galenic tract, was to have a long history in the Byzantine literature, as well as in the Islamic medical literature.

In *De compositione medicamentorum secundum locos* IV, 4 (Kühn XII, 717) Galen states:

In the case of pterygia and the "fig-like" [papillary stage of trachoma] the cleansing (ὑπιπτικά) drugs are helpful, both those molded in the form of a collyrium and those dried without being molded, with which there is mixed a small amount of the caustic (σηπηκτικά) drugs. Related to these are those [drugs appropriate] for dry and itchy scaling (ψωρώδεις διαθέσεις) in the eyelids [blepharitis], and because of this they are called ψωρικά drugs. Of all those things, the strongest, which destroy old calluses and cure that called pterygia, are combinations of cleansing and caustic drugs.

In *Methodus medendi* XIV, 19 (Kühn X, 1018) Galen again⁵⁰ says that the small and soft varieties of pterygium can be healed by means of cleansing drugs, such as those called *trachomatika*, while the large and hard require surgery (χειρουργία), adding the following notion:

Inasmuch as pterygium is unnatural (ἀλλότριον) in the healthy constitution, I consider it to be generally evident that it is nonetheless not unnatural in relation to its own substance (κατὰ τὴν οὐσίαν), as are ἀθήρωμα (a tumor full of gruel-like matter) or μελικηρὶς (a kind of cyst with a honeycomb interior).

In his discussion of the use of cuttlefish "bone" in which he mentions its use as a scraper for trachoma, Galen also described its use as an agent to dissolve pterygia (*De simplicium medicamentorum* XI, 27; Kühn XIV, 410–11):

⁴⁹ For similar statements elsewhere in the Galenic corpus see *De tumoribus praeter naturam* (Kühn VII, 732) and the pseudo-Galenic *Definitiones medicae* 366 (Kühn XIX, 439).

⁵⁰ The word πτερόγιον is also employed in the Galenic corpus for other skin conditions. See, e.g., Galen, *In Hippocratis prognosticum commentaria tria*, ed. I. Heeg (CMG V, 9, 2) (Leipzig, 1915), 212 and *In Hippocratis epidemiarum librum VI commentaria I–VIII*, ed. E. Wenkebach and F. Pfaff (n. 43 above), 19.

⁴⁵ Several are called simply *trachomatikon*, that is, belonging to the class of collyria especially for use against trachoma. Some have special names associated with them. There is the saffron (κροκώδες) collyrium of Antigonos, which Galen states is labeled "the small lion" (λευντάριον) since it is stamped with the image of a small lion (Kühn XII, 773). Galen mentions (K. XII, 775–76) a *trachomatikon* collyrium τοῦ ἰεράκος, literally "of the hawk," but here probably intended as the proper name Hierax, a man whom Celsus had earlier mentioned as having a collyrium for trachoma (see n. 27 above). One collyrium (K. XII, 779) is called "the small chariot" (ἀρμάτιον) for the rather cryptic reason that Ptolemy the King used it. Another (K. XII, 780) was termed ὀρτεμώνιον (? "the small foresail") because it was used by Bassos the Comrade-in-Arms (Βάσσος ὁ ἐταῖρος). The ingredient hematite determined the name of three collyria (K. XII, 732, 775, 779). One collyrium (K. XII, 783–84) is labeled simply "the orange one for general use" (κυδῶδὸν πάγχρασσον), while another (K. XII, 785–86) has the more prestigious title of "worth its weight in gold" (ισοχρῶσσον).

⁴⁶ Fabricius, 192–98.

⁴⁷ Kühn XII, 776. For Areius of Tarsus see Scarborough and Nutton, "Preface," 198–99; and for Apollonius, see Fabricius, 180–83.

⁴⁸ For Paccius (Πάκκιος), a Roman physician of the first century A.D., see H. Diller, "Paccius (4)," *RE* XVIII(2)/2 (Stuttgart, 1942), col. 2063; and Fabricius, 226.

Being composed of very small parts, it [cuttlefish "bone"] is selected as appropriate for other things, for which reason we use it burnt against a dull-white leprosy (ἀλφός),⁵¹ rough spots or freckles on the face (ἔφηλις), moles (φακὰ) and dry itch (ψώρα). But when mixed with quarried salt it dissolves the pterygia formed on the eyes. But before it is burned, when baked and smooth, it polishes teeth and dries ulcers.

The compound remedies offered for pterygium are given in a different treatise from the one presenting remedies for trachoma—that is, in *De compositione medicamentorum per genera* V,⁵² where ten recipes are given for *trochiskoi*, or small tablets which are to be prepared specifically for use in pterygium, as well as in other conditions, such as different types of ulcers and skin disorders. These tablets at the time of application are to be mixed with water or honey. As developers of these troches Galen cites Heracleides of Tarentum, a well-known first-century B.C. physician of the Empiric school, Aristarchus of Tarsus, Areius of Tarsus, Aelius Gallus, one Magnus Philadelphus, and a certain Diodorus.⁵³ Curiously, none of these remedies seem to have passed into subsequent literature. There is only one mention of pterygium among the conditions for which the remedies are prescribed in *De compositione medicamentorum secundum locos*—a short recipe given among ocular remedies ascribed to Archigenes, a physician originally from Syria who lived at the time of Trajan.⁵⁴ The latter remedy is advocated by later physicians.

Although pterygium is defined and described, there is no account of the surgical excision of pterygium in the extant Galenic corpus. Galen is of course known to have written a separate work on

the diagnosis of eye diseases and possibly another on the therapy as well.⁵⁵ These are lost to us today.

An important physician of the fourth century A.D. and model for later Byzantine physicians was Oribasius, who was friend, advisor, and physician-in-ordinary to the emperor Julian the Apostate.⁵⁶ Unfortunately his major encyclopedia, *Ἱατρικαὶ συναγωγαί*, or *Collectiones medicae*, is not extant today in its entirety. This enormous medical compendium relied heavily on extracts borrowed, frequently verbatim, from Galen and other Greek physicians. Neither trachoma, pterygium, or pannus are mentioned in the extant sections. Oribasius does make a very brief reference to pterygium and its treatment by surgery in his collection of easily obtained remedies compiled for the use of laymen entitled *Περὶ εὐπορίστων*.⁵⁷

Another treatise on easily obtainable, common medicines also written in the fourth century was that by Theodorus Priscianus, who served the emperor Gratian (A.D. 367–383) as physician-in-ordinary (ἀρχίατρος). In this compilation, written first in Greek and then in Latin, entitled *Euporista*, Theodorus Priscianus mentions what appears to be a somewhat novel treatment of trachoma, by taking a garlic and inserting the head of a probe in the center of it and, squeezing the juice, anointing the eye with it.⁵⁸ His work combined elements of traditional medicines along with more learned medical practices.

Another compiler of popular and traditional medicines alongside excerpts from scholarly writings was Marcellus, later surnamed Empiricus, of Bordeaux. He was *magister officiorum* under Theodosius I (A.D. 379–395) and in the first decade of the fifth century composed *De medicamentis liber*, containing medicaments and recipes for treating

⁵¹ For the significance of these terms for skin eruptions, see Paul (trans. Adams), II, 17–20. For a general discussion of leprosy and certain skin disorders, see M. W. Dols, "Leprosy in Medieval Arabic Medicine," *JHM*, 34 (1979), 314–33.

⁵² *Comp. med. per gen.* V, 11 (Kühn XIII, 824–25, 829); V, 12 (Kühn XIII, 836–37); V, 13 (Kühn XIII, 838); and V, 15 (Kühn XIII, 856–57).

⁵³ For Heracleides of Tarentum, see H. Gossen, "Heracleides (54)," *RE* VIII(1) (Stuttgart, 1913), cols. 493–96, and Scarborough and Nutton, "Preface," 203. For Areius of Tarsus and Aristarchus of Tarsus, see Fabricius, 92–93, 97, and 225; and Scarborough and Nutton, "Preface," 198–99, 215, and 217. For Aelius Gallus, see M. Wellmann, "Aelius (59)" *RE* I(1) (Stuttgart, 1894), col. 493. Galen also gives one troche called Bithynian which he says was made in Cilicia.

⁵⁴ Galen, *Comp. med. sec. loc.* IV, 8 (Kühn XII, 802). For Archigenes, see M. Wellmann, "Archigenes," *RE* II(1) (Stuttgart, 1896), cols. 484–86; Sezgin, *Geschichte*, III, 61–63; and Fabricius, 198–99. In *De simpl. med.* VI, 9 (Kühn XI, 858), Dioscorides is cited as recommending the use of the dried root of licorice, pulverized in a mortar, as a powdered drug for treating pterygia.

⁵⁵ See, for example, J. Hirschberg, "Die griechischen Sonder-schriften und Abhandlungen über Augenheilkunde," *Archiv für Augenheilkunde*, 85 (1919), 153–57; G. Bergsträsser, *Hunain ibn Ishāq über die syrischen und arabischen Galen-Übersetzungen* (Abhandlungen für die Kunde des Morgenlandes XVII, 2) (Leipzig, 1925), item 54; and see above, note 22.

⁵⁶ See H. O. Schröder, "Oreibasios," *RE* suppl. VII (Stuttgart, 1940), cols. 797–812; and F. Kudlien, "Oribasius," *DSB*, X, 230–31.

⁵⁷ *Euporistes (Libri ad Eunapium)* IV, 24 (ed. Bussemaker and Daremberg, V, 714, cf. VI, 545–46); *Libri ad Eunapium* (ed. Raeder, 448). Eye diseases are also discussed in *Synopsis ad Eustathium*, (ed. Raeder), 262–69 although there appears to be no reference to the diseases under consideration here.

⁵⁸ *Euporiston* I, 12.37 (V. Rose, ed., *Theodori Prisciani Euporiston* [Leipzig, 1894], p. 37); see the German trans. in T. Meyer, *Theodorus Priscianus und die römische Medizin* (Jena, 1909), 109–10.

the diseases from head to foot. In his discussion of eye remedies Marcellus effectively plundered Scribonius Largus, with entire sections agreeing nearly word for word. To these excerpts Marcellus added a few recipes, most of which have an ample portion of a narcotic medicament.⁵⁹ Neither Theodorus Priscianus or Marcellus added significantly to the diagnosis or treatment of these three eye diseases in their accounts.

In the middle of the fifth century one Cassius Felix compiled for his son a medical encyclopedia in Latin⁶⁰ based, according to the author's own statement, upon Greek sources, but showing perhaps a few signs of personal experience as well. In his discussion of the treatment of trachoma he presents quite a detailed description of the scraping procedure, followed by the expression "*miraberis hoc factum*," which might indicate actual experience with it. Cassius Felix heads his discussion of trachoma⁶¹ with "*ad trachomata id est asperitates palpebrarum et ad sycosin, quam nos ficitatem dicimus*," which seems to indicate that he considered σύκωσις, or the papillary stage of trachoma to be a disease distinct and separate from trachoma. He continues by saying that the latter is called *sycosis* or *ficitas*,

since the roughnesses on the eyelids appear similar to the seeds of a fig. For the cure you painstakingly rub the *asperitates*, with the eyelid everted, with either pumice or soft "bone" of cuttlefish—that is, with the cortex removed (*osso sepiæ molli hoc est detracto cortice*) until it is bloody. Then you carefully clean and astringe them with a sponge (*penicillo*) squeezed with cold vinegar-water. After that you use the *trachomaticum* collyrium which they call *paedicon*, that is, for a child, since it is appropriate for small children. For *reumata* and *trachomata* it is beneficial if you loosen them with water and anoint under the eyelid (*sub palpebro*) or under the lids (*sub ciliis*) which the Greeks call *ex hypoboles*.⁶² *Miraberis hoc factum*.

After this there follows a recipe.

The next source chronologically was written some four hundred years after the time of Galen. Aëtius of Amida was born in Amida on the upper Tigris river, now Diyarbakir in Turkey, and resided in By-

zantium. He carried the title *comes obsequii*, which was not introduced until the reign of Justinian I (A.D. 537–567). The title implies a high rank at court, possibly military, and it has been suggested that he might have been court physician to Justinian.⁶³ Aëtius's medical encyclopedia, Βιβλία ιατρικὰ ἐκκαίδεκα, consisted, as the title implies, of sixteen books. The seventh book of this compendium is devoted to ophthalmology and is a rich source of information on the practices of oculists prior to Aëtius whose works would otherwise be unknown to us today.

In Book VII, chapter 45, Aëtius presents⁶⁴ a discussion of trachoma taken from Severus, a physician and oculist at the time of Augustus.⁶⁵ Severus, according to Aëtius, said that roughnesses (τραχώματα), which many call rawnesses (δασύματα), occur often as a result of unskilled treatment. The condition also, he says, arises following a chronic, very non-pungent discharge (ἐκ ῥευματος πολυχρονίου ἀδηκτοτέρου), "for if it were acrid (δριμύς) it would destroy the eye before establishing disease on the eyelid." Severus says (according to Aëtius) that occasionally the condition arises without a preceding discharge and with no apparent cause. In the latter circumstances, however, there is something like small grains of millet or small peas protruding on the inner surface of the eyelid. When there is a preceding discharge, the everted lids appear somewhat raw, rough and blood-red. He then states that the following distinctions should be drawn in the development of trachoma:

[1] The rawness (ἡ δασύτης) is superficial and accompanied by redness; [2] the rough state (ἡ τραχύτης) has greater irregularity and protrusion, accompanied by pain and heaviness. Both [of the first two stages] are accompanied by watering of the eyes. [3] The so-called fig-like (ἡ σύκωσις) shows higher protrusions which seem to be notched and resemble nothing as much as a fig ripe to bursting. [4] The forming of cal-luses (ἡ τύλωσις) is [a feature] of inveterate roughness and shows the altered parts to be hardened and calloused.

Severus says that some physicians try to shave off the roughness using a knife or fig leaves, but he

⁵⁹ Esp. Marcellus Empiricus, *De medicamentis liber VIII* (ed. Liechtenhan, I, pp. 110–69). For general comments regarding Marcellus, see H. J. Rose, *A Handbook of Latin Literature* (New York, 1960), 428.

⁶⁰ V. Rose, ed., *Cassii Felicis De medicina ex graecis logicae sectae auctoribus liber translatus sub Artabure et Calipio consulibus (anno 447)* (Leipzig, 1879). Little is known of this particular figure.

⁶¹ Cassius Felix XXIX (ed. Rose, p. 55).

⁶² ἔξ ὑποβολῆς, an expression used by Antyllus according to Oribasius (X, 23.24) and by Severus according to Aëtius (VII, 32), and later in the ninth century by Leo to mean "by interpolation" or beneath the eyelid. For Aëtius and Leo see below.

⁶³ See F. Kudlien, "Aëtius of Amida," *DSB*, I, 68–69.

⁶⁴ Aëtius (ed. Olivieri [CMG VIII, 2]), pp. 297–300; *Die Augenheilkunde des Aëtius aus Amida*, ed. and trans. J. Hirschberg (Leipzig, 1899) 107–15. For an English translation see T. H. Shastid, "History of Ophthalmology," *The American Encyclopaedia and Dictionary of Ophthalmology*, ed. C. A. Wood, XI (Chicago, 1918) 8662–64.

⁶⁵ See F. E. Kind, "Severus (48)," *RE*, II(2) (Stuttgart, 1923), cols. 2010–11. Aëtius's seventh book is our major source of information on Severus.

warns that this is harmful, for usually the formations are only increased and hard scars produced. He does recommend as treatment for trachoma (τὰ τραχώματα), when there is no ulcer (ἔλκος) in the eye nor inflammation, everting the lids and anointing with remedies prescribed for children, and massaging them for a long time with the head of a probe (μήλη); if rubbing is stopped too soon, greater roughness and discharges to the eye are produced. If the trachoma continues, stronger remedies are recommended. Aëtius notes that he has found the dry collyrium of Severus to be extremely useful, after which he gives recipes for six compound remedies.⁶⁶

Aëtius states⁶⁷ that when inflammation of the eyes accompanies the trachoma, it is necessary to add some of the cleansing (ῥυπτικά) drugs to the remedies specifically for inflammation (φλεγμονή). He repeats the warning of Galen that if there is an ulcer with acrid discharge the usual drug remedies are not to be used, for the cornea will be corroded, prolapse of the iris will increase, and the pain for the patient and the corrosive discharge will be made worse. For these patients he recommends, as did Galen, the collyrium of finely powdered pumice combined with tragacanth or gum. He then presents the rest of the therapy as described by Galen in *De compositione medicamentorum secundum locos* IV, 2, given above.

In chapter 60 of the same book Aëtius discusses pterygium in general, with drug remedies given in chapter 61 and the surgical procedure in chapter 62. In this account Aëtius cites no particular authority as a source. He begins with the statement:⁶⁸

It is said to be pterygium (περύγιον) when upon much growth (αὔξηθέντος) or excess flesh (ὑπερσαρκώσαντος) of the white of the eye, as a result of blepharitis (ψωροφθαλμία) or oppressive discharge, an outgrowth spreads contrary to nature (παρὰ φύσιν).

⁶⁶ This includes one recipe drawn from Apollonius and one attributed to a certain Theophilus. Brief mention is also made of a collyrium called the Phoenix and one called Dionysius. For Apollonius, a name also associated with a trachoma remedy by Galen, but one of different composition see above, note 47. Galen also advocated a Phoenix collyrium.

⁶⁷ Aëtius of Amida (ed. Olivieri), 313–16; ed. J. Hirschberg, 145–51. See also Shastid, “History” (n. 64 above), 8672–74.

⁶⁸ Following the reading of Olivieri, who reads αὔξηθέντος “growth” instead of ἔλκωθέντος “ulcers,” and ὑπεροχή τις παρὰ φύσιν ὑποστή “an outgrowth spreads unnaturally” instead of ὑμὴν λεπτὸς καὶ νευρώδης ἐπιδράμη τὸν ὀφθαλμόν “a delicate, tendon-like membrane spreads over the eye;” Aëtius (ed. Olivieri, 313). This corrects the conjectural reading of Hirschberg. See also A. Olivieri, “L’Oftalmologia di Aetios nel cod. Laurenziano 75,5,” *Studi italiani di filologia classica*, 12 (1904), 274.

He adds that it usually begins at the larger, nasal canthus, but may occur at the other canthus or even closer to the upper or lower lid, and in all cases extends to the dark of the eye and may even reach the pupil, in which case it interferes with vision. Aëtius distinguishes different colors of pterygia: white with a small base which he says is easy to cure; the contrary (ἐναντία) are difficult, for those which are somewhat reddish tend after surgery to cause necrosis (σφάκελος) and hemicranial headaches, although after these symptoms are removed the eye is well. He does warn, however, that pterygia which are accompanied by the onset of cataract (ὑπόχυσος) cannot be treated, for if pterygium is removed the cataract will develop more quickly. Nor should one treat pterygia which are thickened, rolled outward, protruding, hard, and accompanied by sympathetic headaches, for these are malignant (κακοήθη) and cancerous (καρκινώδη). In the case of pterygia which have covered the pupil, Aëtius notes that their removal will free the eye of discharge, but the operation will result in a scar (οὐλή) near the pupil which will nonetheless impair vision. The pterygia which are large and cover the dark of the eye (cornea) must be removed surgically, while those restricted to the white of the eye can be shrunk with drug therapy. There then follow in the next chapter twenty recipes, including the one from Archigenes which Galen had earlier given.⁶⁹

Aëtius’s description of the surgical procedure omits any statement as to the position of the patient, although he does say that if the patient refuses to open his eyes, a blunt hook should be gradually slipped between the upper lid and the eyeball and then drawn up, after which one can operate. The technique for the surgery is basically the same as that described by Celsus: a tiny hook inserted into the middle lifts the growth away from the eye, so the epidermis (ἐπίδερμα) of the cornea will not be detached, for he warns that if the latter occurs, a severe inflammation will result. A horse-

⁶⁹ Following the text edited by A. Olivieri, which has twenty recipes instead of thirteen as in the Hirschberg edition (see above, note 64). Among the compound remedies advocated by Aëtius is the Theodotian (θεοδότιον) collyrium of Severus, that is, the collyrium attributed by Severus to Theodotus. The collyrium of Theodotus is also given by Celsus (VI, 6.6), though no specific mention is made of using it for trachoma or pterygium. This reference by Severus (as related by Aëtius) to a compound drug by Theodotus gives scholars the *terminus post quem* for Severus himself; see Kind, “Severus (48)” (n. 65 above). Aëtius also recommended all the cleansing collyria used for trachoma, as well as those used for “flyhead” (μυιοκέφαλον), a condition in which the uvea protrudes like a fly’s head, and staphyloma (σταφυλωμα), the best of which he says contain wine.

hair and a linen thread are inserted into a needle and passed under the raised pterygium. The physician then holds the horsehair and linen thread in both hands and moves them about under the pterygium to separate the growth from what is under it, beginning at the cornea and moving to the canthus. Aëtius says the pterygium is removed from the cornea by means of the horsehair and thread, while the attachment to the canthus is removed with the “pterygium knife” (περυγοτόμος), taking care not to injure the lids or the canthus itself, for that will cause adhesions or, if the canthus is completely removed, a running of tears. Aëtius states that if it is not entirely excised it will recur.⁷⁰ After the operation salt water should be dropped into the eye, and then wool soaked in egg white should be applied and the eye bandaged. On the next day it should be anointed with the White, Mild Collyrium of Severus and on the fourth day with one of the “collyria for eye diseases” which he says consist of the one from nard and the one of Theodotus;⁷¹ for the rest of the treatment one should avoid the gentle (ἀπαλά) and flesh-forming (σαρκωτικά) collyria.

The account by Aëtius of the treatment of pterygium and trachoma is the most complete to come down to us from Byzantine literature.

Born in the first half of the sixth century A.D. in Lydia, a province of Asia Minor, Alexander of Tralles composed a *Θεραπευτικά* in eleven books, the second of which was concerned with the therapy of the eyes. He was the son of a physician Stephanus, and had four learned brothers, one of whom was also a physician. It seems that for a while he practiced in Rome, and he mentions having traveled to Spain and Gaul. His writings were widely read and used in the Islamic world.⁷²

Alexander employed the writings of Oribasius, Galen, and Aëtius as sources, although he did more than simply compile excerpts from previous writers, as had been the practice of Aëtius and Oribasius before him. While not usually naming sources, he appears either to have employed some writings now unknown to us or to have incorporated material originating from his own experience. This is particularly evident in some of his writings on other

topics.⁷³ Compound remedies dominate his chapter on eye diseases in the *Θεραπευτικά*.⁷⁴ Four recipes are given for use against trachoma (τραχέα βλέφαρα, σύκωσις), only one of which bears a special name, the Great Theodotian. This is similar in composition to that associated with the name of Theodotus by Aëtius as drawn from Severus. For pterygia he specifically recommends the Hecatomb (ἡ ἐκατόμβη) collyrium consisting of fifteen ingredients, while four additional recipes can be employed in both conditions.

There is no general definition or description of either pterygium or trachoma, nor anything which might be interpreted as pannus, nor are there instructions for the surgical removal of pterygium or even basic steps in the scraping of trachoma. There is only a short paragraph⁷⁵ following one of the *trachomatika* collyria reminding the reader that when ulcers occur along with the trachoma, the lids should be everted and wiped with the curve of a probe or leaves of a fig tree. (Note that this is precisely the opposite of what Aëtius advocated.) Some, Alexander says, use the “bone” of the cuttlefish or a very rough skin, while others rub in one of the collyria made with pumice. When the eyelids are quieted and attenuated, the ulcers are to be treated with either the Libian (λιβιανόν) or Celestial (οὐράνιον) collyrium. If the case is not very severe the Theodotian collyrium can be employed directly.

The Libian collyrium is one of a class of collyria known also to Galen, while the Celestial collyrium, as well as the Hecatomb and some of the unlabeled compounds, appear to be new introductions into the extant literature. In regard to the nature, diagnosis and general therapy of these particular conditions, however, this treatise is far from as informative as its predecessors.

In his *Θεραπευτικά* Alexander of Tralles mentions having written an earlier treatise on the diagnosis, causes, and therapeutics of eye diseases, as well as on collyria.⁷⁶ This treatise is now lost to us. An anonymous treatise on eye diseases was found bound with a manuscript copy of the *Θεραπευτικά* of Alexander of Tralles. The editor of this anonymous tract⁷⁷ suggested that it in fact was written by Alexander of Tralles in his youth while

⁷⁰The earliest reference to what must have been the observation that the recurrence of pterygium is quite usual. This recurrence defies all medical techniques known today; see Trevor-Roper, *The Eye* (n. 4 above), 461.

⁷¹See above, note 69.

⁷²See F. Kudlien, “Alexander of Tralles,” *DSB*, I, 121; Ullmann, *Medizin* 85–86; and Sezgin, *Geschichte*, III, 162–64.

⁷³See F. Kudlien, “Alexander of Tralles,” *DSB* I, 121.

⁷⁴Alexander (ed. Puschmann), II, 2–60, esp. 46–53 and 64–65.

⁷⁵*Ibid.*, 48–49.

⁷⁶*Ibid.*, 2.

⁷⁷T. Puschmann, *Nachträge zu Alexander Trallianus. Fragmente aus Philumenus und Philagrius nebst einer bisher noch ungedruckten Abhandlung über Augenkrankheiten. Nach den Handschriften heraus-*

in Asia Minor. More evidence is needed to confirm this assertion, however.

The tract has no recipes, for the third book, devoted to compound remedies, is now missing. Pterygium is defined with a slight reworking of Galen's definition in *De remediis parabilibus* quoted above:⁷⁸

What is pterygium? Pterygia are sinewy outgrowths (αἱ νευρώδεις ἐπιφύσεις). The origin of them is from the large canthus. Gradually around the limbus it grows upon the black. Sometimes, when it has grown beyond the normal amount (πέρα τοῦ δέοντος) it also impedes the pupil.

Nothing else is said of pterygium, although when discussing adhesions of the eyelids the author says that such adhesions are frequently treated with "the surgery of pterygia" (χειρουργία πτερυγίων).⁷⁹

The first two stages of trachoma are treated together, while the third and fourth are treated quite separately, with discussions of other conditions intervening, as if the author did not realize that all four were really stages of the same disease. No general term for trachoma occurs.

Of the first two stages (δασύτης and τραχύτης) it is said that they:⁸⁰

... develop on the inside of the eyelids. They differ from one another in that the first consists for the most part of redness while the second has more unevenness, with pain as well as discomfort. Both cause the eye to water.

Further on,⁸¹ the anonymous author says of the fourth or cicatricial stage of trachoma: "τύλωσις is a chronic roughness (τραχύτης χρονία) having irregularities which are hardened and coarse." Four paragraphs later the third stage is characterized:⁸² "σύκωσις has large and separated papillae (ὕψηλο-τέρραι) and resembles an opened fig." Nothing further is said of these conditions.

Little is known of the life of the seventh-century Byzantine physician Paul, who was born on the island of Aegina in the Saronic Gulf and was trained at Alexandria. He also practiced in Alexandria, but it is uncertain how much of his tenure there overlapped with the Islamic invasion and occupation after A.D. 640. Paul of Aegina covers trachoma and pterygium in his discussion of diseases of the eye

which comprises the twenty-second chapter of the third book of his *ὑπόμνημα* (*Memorandum*), with the surgical removal of pterygium described in the eighteenth chapter of the sixth book, which is devoted to surgery.⁸³ Trachoma (τὰ τραχώμα), he says, is a roughness (τραχύτης) on the inside of the eyelids. An advanced form appears like clefts, for which reason it is called fig-like (σύκωσις), while it is called callosity (τύλωσις) when it is long-lasting and callous. In this, Paul follows Aëtius in his terminology, although without the explicit four stages. Paul mentions briefly that if the callosity is hard, then one must rub the lid with pumice, or with cuttlefish "bone," or fig leaves, or with the instrument called βλεφαρόξυστον "the eyelid scraper."

When describing pterygium (Book III, 22, sec. 25) Paul repeats Galen's basic definition that it is a "sinewy" (νευρώδης) projection of the conjunctival membrane. Paul's discussion consists of a nearly literal quotation (without citing Galen) of Galen's description of pterygium in *De remediis parabilibus* quoted above, without adding anything new except for a compound remedy and the note that some mix the gall of a goat with honey and anoint with it, the latter being a practice mentioned by Celsus.

In drug therapy Paul cites Oribasius as one source and appears to have relied as much upon Alexander of Tralles, or a common source, as upon Galen. For trachoma he recommends eight compound remedies.⁸⁴ One unnamed dry collyrium is identical to that given by Alexander of Tralles, though he is not cited as a source. Another is attributed in the text to Galen though it differs from any extant recipe of Galen.⁸⁵ The ἄρματιον collyrium given by Paul is identical to that given by Galen (Kühn XII, 779), which he drew in turn from Asclepiades Pharmacion. A Cygnus collyrium (κυκνάριον) mentioned by Paul is quite similar to that known to Celsus (VI.6.7) as *cycnon*. The saffron collyrium, however, as prescribed by Paul differs markedly in composition from those of the same designation advocated by Aëtius, Galen, and Celsus. Both saffron and cygnus, however, are names given to entire classes of collyria.

⁷⁸ Paul (ed. Heiberg), I, 176 and 181–82; and II, 58–59; Paul (trans. Adams), I, 414 (cf. 428), 418–19 (cf. 432–33), and III, 275–77.

⁷⁹ The collyria are given in Book VII, chapter 16. Some recipes state that they are to be used for trachoma or pterygium. Others are cited by name in Book II, 22 and Book VI, 18 of the treatise.

⁸⁰ I have been unable to find the recipe given by Paul among those listed by Galen, although it does bear some resemblance to that called βασιλίδιον (Kühn XII, 786–87).

gegeben und ins Deutsche übersetzt (Berliner Studien für classische Philologie und Archaeologie, V, 2) (Berlin, 1886), 130–33.

⁷⁸ *Ibid.*, 142–43.

⁷⁹ *Ibid.*, 146–47.

⁸⁰ *Ibid.*, 144–45.

⁸¹ *Ibid.*, 146–47.

⁸² *Ibid.*

For pterygium Paul advocates one remedy from Oribasius plus all those employed for trachoma and a condition called leucoma. These include a Hecatomby collyrium identical to that of Alexander of Tralles and one called ῥινάριον "small file" which differs substantially from remedies with similar names in earlier writings.⁸⁶

In the treatment of pterygium presented among the surgical procedures, Paul again defines pterygium and says it can obstruct the movement of the eyeball,⁸⁷ as well as cover the pupil and thus obstruct vision. Paul states that the thin and white type is easiest to cure and should be excised, omitting a discussion of other types and complications of pterygia which had concerned Aëtius. His account of the surgical procedure and care following excision is a shortened version of Aëtius's description, with no new additions.

Paul made no claim to originality in his writing.⁸⁸ And indeed, as can be seen in the preceding summary, he drew heavily, and at times word for word, from Aëtius and from Galen, as well as other sources such as Oribasius and perhaps Alexander of Tralles. The precise debt to Oribasius in this context is of course difficult to assess, since the section of Oribasius's treatise which was concerned with these conditions is lost. Even the surgical treatment displays no new techniques or personal experience on the part of the author. His medical encyclopedia was, however, of enormous influence in subsequent medical thought, especially in Islamic lands, where it circulated widely.⁸⁹

When we turn to the ninth-century medical epitome written by Leo, we find a succinct but well-written summary of the nature and treatment of pterygium along with some new compound remedies. Leo was a physician and philosopher living at the time of the emperor Theophilus (A.D. 829–842). He wrote his Σύνοψις ἰατρικῆ for a younger physician, Georgius.⁹⁰ Concerning pterygium Leo says:⁹¹

Pterygium is an excess of flesh (ὑπερσάρκημα) of the conjunctiva beginning from the large canthus and

⁸⁶Galen has one collyrium called ῥίνημα "small filings" (Kühn XII, 778–79) and Celsus (VI, 6.30) one called *rinion*. Both are very different.

⁸⁷It can indeed mechanically interfere with the movement of the eye when very extensive.

⁸⁸See P. D. Thomas, "Paul of Aegina," *DSB*, X, 417–19, and E. F. Rice, Jr., "Paulus Aegineta," *Catalogus*, IV, 145–91.

⁸⁹See Ullmann, *Medizin*, 86–87; and Sezgin, *Geschichte*, III, 168–70.

⁹⁰See Hunger, "Medizin," 305; and Hirschberg, *Geschichte*, 365–66.

⁹¹*Conspectus medicinae* III, 20 (in Ermerins, 136–37).

extending up to the pupil, at which point, when it has grown large, it obscures it. Therefore we use pterygotomy, inserting with a needle (βελόνη) a horsehair and thus cutting; and then we use collyria suited for staunching (κατασταλτικά) and attenuating (λεπτά), such as the one of Constantine, the one made of harts-horn, and the one made of mussel. Pterygium rarely occurs from the small canthus.

When defining pterygium as an excrescence, Leo has dropped the adjective "sinewy" (νευρώδης) used by most of his predecessors. The term πτερυγοτομία for excision of pterygium appears here for the first time in the literature surveyed. The three collyria are also new to the accounts.

It is evident from Leo's discussion of trachoma that a complete appreciation of the four stages of trachoma as stated by Aëtius was lacking in the literature available to Leo in the ninth century. In chapter eight of the third book Leo has the following to say:⁹²

It is called trachoma (τραχώματα) when you turn the eyelids inside out and you see on them something of a seed (κεγχραμύς) having some roughness like those in figs. For these we use the collyria called *trachomatika*, such as that made with wine, the one made of two stones, and similar ones. When the trachoma becomes very old and stone-like it is called τύλωσις (callosity).

Yet in chapter ten of the same book he says:⁹³

Fig-like (σύκωσις) is when you evert the eyelids and you find excess flesh of some redness, like figs. And these are treated with *trachomatika* collyria, which we anoint from beneath (ἐξ ὑποβολῆς, that is, under the eyelid).

From this it appears that Leo considered σύκωσις, the fig-like papillary stage which Aëtius and Paul viewed as the third stage, to be a separate ailment which was, however, to be treated in the same manner as τραχώματα. Under the latter term he grouped the first two stages and the fourth, consisting of τύλωσις, or the formation of calluses. This evident separation of the papillary stage of trachoma from the other stages, to be seen also in the writings of Cassius Felix in the fifth century, may simply have been an outgrowth of a custom evident in writings prior to Aëtius in which the papillary stage is sometimes discussed separately from general roughness of the eyelids, with no mention of well-defined stages of trachoma. This tendency can be seen, for example, in Galen's discussion of trachoma in *De compositione medicamentorum secundum locos* and *De simplicium medicamentorum* quoted

⁹²*Conspectus medicinae* III, 8 (in Ermerins, 130–31).

⁹³*Conspectus medicinae* III, 10 (in Ermerins, 130–31).

above. If such is the case, it would indicate that for the diagnosis of the condition, the early writings were of greater influence than those of Aëtius and Paul. It is notable that Leo makes no mention of the quite common practice of scraping trachoma. Perhaps the practice was becoming less common. Could he in this regard have been following the advice of Aëtius to avoid scraping rather than that of Paul and others who completely overlooked Aëtius's warning? Leo's synopsis, of course, may well have been based upon sources unknown to us today, with some personal experiences as well determining his selection of comments.

In the tenth century, Theophanes Nonnus compiled an epitome of therapeutic practices which for our purposes is very limited. This abstract from older medical writings was prepared at the request of Constantine VII Porphyrogenitus.⁹⁴ The synopsis was based to a large extent, and often very literally, upon Oribasius—so much so in fact that one copyist indicated in the margin of his copy that he supposed the entire writing to be by Oribasius.⁹⁵ Unfortunately we are missing the equivalent sections of Oribasius's tract and so cannot compare them. It appears that in the case of eye diseases, however, Theophanes was highly selective, for only pterygium is mentioned by him. There is no discussion whatsoever of trachoma. Of pterygium, Theophanes says simply:⁹⁶ "Pterygium is an excess of flesh of the conjunctiva beginning at the large canthus and spreading out to the pupil." Following this nearly word-for-word repetition of the definition given by Leo, Theophanes gives two untitled compound remedies. No mention is made of surgical treatment.

Moving ahead two centuries,⁹⁷ the next text, chronologically, to contain pertinent material was written between 1270 and 1280 by Nicolaus Myrepsus, court physician (ἀκτουάριος) at Nicaea

under the emperor John Vatatzes.⁹⁸ Myrepsus composed a treatise on compound remedies (Δυναμερόν) which was to have great influence through Latin translations as late as the seventeenth century. The work may well reflect his own experience in the field of drug making, since the name by which he became known, Myrepsus (μυρεψός) is equivalent to the Latin *unguentarius*, one who prepared unguents, although it is possible that the title was given him after his death on the basis of his having compiled the treatise rather than for his expertise during his lifetime.

The twenty-fourth chapter of his treatise concerns collyria.⁹⁹ Collyria given numbers 1, 20, and 21 are all recommended for pterygia and bear special names. They do not appear in previous literature. Their names are κολούριον σωτρία μανιθῶνος (*sic*) "the salutary collyrium [called] Manithonos (?); the collyrium called ἱερὰ ἄγκυρα (*sic*) ἐκ τοῦ ποντικῆς "the sacred anchor of the one from Pontus"; and κολούριον θεοδώρητον ἀσκληπιάδου "the God-given collyrium of Asclepiades."

Collyrium number 42 is one "called that made with Scylacian stones" (τὸ διὰ λίθων σκυλακίων λεγόμενον), to be used for trachoma (τραχώματα) and the fig-formation (σύκωσις). The recipe is nearly identical in composition to that given by Paul of Aegina (VII, 16) as a collyrium "from two stones" which was also cited by Leo as a treatment for trachoma.¹⁰⁰ Myrepsus has a collyrium (no. 36) titled κολούριον μονοήμερον τὸ περιβοήτον "the much-

plete Arabic copy, of the same title, available (Bethesda, Md., National Library of Medicine, MS A92, item 2, fols. 1–33a, with ophthalmological material fols. 2a–6b). Consequently, further evaluation of the Greek rendering of the text and its faithfulness to the original, as well as its relationship with subsequent Greek texts, will be postponed until another complete copy of the Arabic can be studied.

⁹⁸ See Hunger, "Medizin," 312; and K. Vogel, "Byzantine Science," *CMH*, IV, pt. 2, ed. J. M. Hussey (Cambridge, 1967), 291.

⁹⁹ Unfortunately the Greek text of this important treatise still remains unedited. I have for this study employed Oxford, Bodleian Library, MS Barocci 171, which is a fifteenth-century copy of the treatise. The chapter on collyria occupies fols. 115^v–121^r. Each recipe is numbered within each chapter. The numbers in the manuscript do not always correspond with those given in the Latin translation by L. Fuchs, *Nicolaus Myrepsi Alexandrini Medicamentorum Opus, in sectiones quadraginta octo digestum, hactenus in Germania non visum, omnibus tum Medicis, tum Seplesiaris mirum in modum utile* (Basel, 1549), of which Chapter 24 occupies cols. 373–90. For the confusion of Latin texts associated with the name Nikolaus, see F. K. Held, *Nicolaus Salernitanus und Nikolaos Myrepsos* (Inaugural Dissertation, Leipzig, 1916).

¹⁰⁰ Myrepsus differs from Paul in having saffron instead of cassia and adding myrrh in his list of ten ingredients. The word σκυλάκιων calls to mind the σκυλάκιον collyrium of Apollonius given by Galen (Kühn XII, 776) and also Aëtius (VII, 112), but the recipe of Myrepsus is entirely different. Myrepsus also shows

⁹⁴ See Hunger, "Medizin," 305–6; and Hirschberg, *Geschichte*, 366–67.

⁹⁵ Hirschberg, *Geschichte*, 366 note 5.

⁹⁶ *Epitome de curatione* III, 63 (ed. I. O. S. Bernard, I [Gotha, 1794] 240–41).

⁹⁷ It had been my intention to compare the tenth- or eleventh-century Greek translation made of the treatise entitled *Kitāb zād al-musāfir wa qūt al-hādīr* ("Provisions for the Traveler and Food for the Settled") with the Arabic original written by Abū Ja'far Ahmad ibn Ibrāhīm ibn Abī Khālid al-Jazzār, who died about A.D. 1004 (see Ullmann, *Medizin*, 147–49, and Sezgin, *Geschichte*, III, 304–7). The Greek translation under the title Ἐφόδια mentions pterygia as well as some other conditions. Neither the Greek text nor the Arabic have been published. I examined the Greek copy in Oxford, Bodleian Library, MS Laud. Gr. 59 (the ophthalmological section occupies fols. 89^v–99^v); however, the tract did not in any way line up with the one com-

talked-about curing-in-one-day collyrium," whose only specified use is in treating pterygia. The name μονοήμερον is a very common one for a collyrium; many different recipes are found under this title, and indeed Myrepsus himself has four different compounds under that name. The name, which occurs on Roman collyria seals as Monohemerum,¹⁰¹ is also used by Paul, Aëtius and Marcellus Empiricus, though their recipes bear no resemblance to the one cited by Myrepsus for pterygia. From the name of the collyrium Phoenix (no. 31), also to be used in pterygia, one would expect the composition to be similar to that given by Galen and Aëtius for the same purpose. But such is not the case, for the eleven ingredients are totally different from the six in the earlier versions. What is more interesting, Myrepsus has interpreted the name Phoenix literally—that is, as date-palm (φοίνιξ) and so has included in his recipe "stones from the fruit of date-palm trees, burnt and ground." In the early recipes the Phoenix collyrium had nothing to do with date-palms.

In this limited sampling we see that Myrepsus displays some dependence upon the recipes transmitted by Paul, but virtually none upon those of Aëtius and Galen, and that he, or some unknown intermediate source, introduced new collyria with new names and apparently reinterpreted some of the older names. It is of interest that five of the six recipes are for pterygia. The one mentioning trachoma also names the "fig-like formation" (σύκωσις), suggesting that once again the two were viewed as separate conditions.

The last figure to be included in this survey is Johannes Actuarius, court physician (ἀκτουάριος) in Constantinople to the emperor Andronicus III (A.D. 1328–1341). Johannes Actuarius has rightly been praised as a physician, though firmly within the Galenic tradition, demonstrating personal experience and observation in his writing.¹⁰² These qualities are displayed in his treatise on urine, a tract on pneumonia concerned in part with the powers and disorders of the mind, and in parts of a

large book on *Methods of Treatment* (Θεραπευτικὴ μέθοδος). Of the latter treatise only the first two books, on diagnosis (Περὶ διαγνώσεως), have been edited.¹⁰³

The discussion of trachoma and pterygium by Actuarius is at first encounter disappointing because of the nearly literal extraction of passages from earlier writings. The short entry on pterygium is nothing but an almost word-for-word transcription of Galen's first sentence in *De remediis parabilibus*, quoted above, with an additional phrase or two. Actuarius says:¹⁰⁴

Among the diseases of the eye belong pterygium, which is a "sinewy" (νευρώδης) projection of the conjunctival membrane beginning at the canthus and going forward to the limbus; if by chance the pterygium can grow no larger (ἂν γε μὴ ὑπερᾶνξηθὲν τὸ πτερύγιον τύχη) it also covers the pupil itself and hinders the vision (τοῦ ὁρᾶ κωλύει).

Nothing else is said of this condition.

When writing the entry on trachoma, however, Actuarius seems to have been more concerned than previous writers with the differential diagnosis of trachoma from other conditions of the eyelid. To achieve this end Actuarius took the first sentence of Paul of Aegina's paragraph on trachoma, the first sentence of his statement on chalazion and the first sentence of his description of the sty. ¹⁰⁵ To these Actuarius then added a sentence of his own:¹⁰⁶

Trachoma (τράχωμα) is a roughness of the inner surface of the eyelid. When intense, having the appearance of incisions, it is called σύκωσις "fig-like." When chronic and thus made callous, it is called τύλος "callus." From these chalazion (χαλάζιον) differs, being a concretion of water on the eyelid. But that called sty (κριθή), as all know, is an elongated abscess (ἀπόστημα) on the inside of the eyelid. When the eyelids have lice, and the disease from them is clearly visible, it is called phthiriasis (φθειράσις, pediculosis palpebrarum); and to those observing sharply they appear living animals and to be moving.

These abstracts were arranged by Actuarius in such a way as to give them more significance for comparative diagnosis than they had had in the original work of Paul. The last sentence is not in the

dependence upon Paul in the twenty-seventh collyrium, called πρωτεύς, recommended for cicatrices and calluses. It is very similar to that given by Paul (VII, 16) for the same purpose. Since Proteus is a common name on Roman collyria seals, it is likely a name of a group of recipes (see Nielsen, *Ancient Ophthalmological Agents* [n. 30 above] 23).

¹⁰¹ See Nielsen, *Ancient Ophthalmological Agents* (n. 30 above), 22–23 and 87.

¹⁰² See Hunger, "Medizin," 312–13; Vogel, "Byzantine Science," *CMH*, IV, pt. 2 (1967), 291; and Kudlien, "Alexander of Tralles," *DSB*, I, 121.

¹⁰³ Ideler, II, 354–464. The ophthalmological portion (pp. 444–49) was reprinted and translated into German by J. Hirschberg, "Die Augenheilkunde bei den Griechen," *Archiv für Ophthalmologie*, 33:1 (1887), 48–78.

¹⁰⁴ Hirschberg, *ibid.*, 56–57.

¹⁰⁵ Paul of Aegina III, 22 (ed. Heiberg, I, 176–77).

¹⁰⁶ Hirschberg, "Die Augenheilkunde bei den Griechen" (n. 103 above), 54–55.

treatise of Paul, although he does mention a compound remedy for treating lice. Actuarius's productive arrangement of the abstracts from an earlier writer, alongside a note possibly from his own observations, resulted in a concise but useful, even though derivative, guide to the diagnosis of trachoma and its differentiation from other conditions which Actuarius thought might be confused with it.¹⁰⁷

Even though we possess now only a few pertinent texts from a span of time extending over a thousand years, we may still venture some conclusions regarding the general development of Byzantine ophthalmological knowledge and care. In the early Byzantine literature, written from the fourth through the seventh centuries, when Alexandria was still the center of activity, we see the great reference works being compiled. It was indeed a formative, although perhaps not highly original, period when the great encyclopedists Oribasius, Alexander, Aëtius, and Paul composed their summaries of previous theory and practice. From our perspective, the importance of Oribasius and Alexander is difficult to evaluate, since most of their writings on our topic are now lost. Certainly Aëtius supplied the fullest account of trachoma and pterygium and their treatment in the Greek literature, based according to his own account to a large extent upon the first-century B.C. physician Severus. Aëtius's masterful account presented definitions, causes, complications, concomitant afflictions and their effect upon the treatment, as well as therapy for the ailments, which included drug treatment and intricate surgical procedures, with admonitions to physicians on things to avoid.

As early as the seventh century, however, in the encyclopedia of Paul there are indications of a beginning lack of interest in the theoretical aspects of the causes and interrelationships of diseases. While Paul does have the observation that pterygium can obstruct the movement of the eyeball, there is not as much in his presentation that betrays actual experience as is evident in that given by Aëtius (or by Aëtius's immediate source). Even the surgical section of Paul, for which he was to become so

renowned, is in this case an inferior restatement of that given earlier by Aëtius.

When we turn to the middle and late Byzantine periods centered in Constantinople, it is true that our sources grow less numerous. But it is also true that what ones we do have show less and less interest in theoretical matters and in surgery—in fact in any therapy except drug therapy—and even very little interest in regimen or accurate diagnosis. Confusion increases, for example, about the stages of trachoma, with some writers apparently considering them to be distinct diseases. On the other hand, it should be noted that the Byzantine writers did not err in regarding pterygium as one of the sequelae of trachoma, as did the Islamic physicians. In general the descriptions of these diseases become more succinct, pedantic, repetitive, and less useful, and thereby, one might conclude, reflecting little personal experience.

What appears to be happening is an increasing lack of interest in diagnosis, general therapy, surgical therapy and even in regimen. The only subject that really holds the attention of late Byzantine physicians with regard to these conditions is drug therapy, and to that they added new compound remedies, but not (at least for these diseases) new simples. The other aspects—accurate diagnosis (with the exception of Johannes Actuarius, who does at least display a concern over this matter), the interrelationship of diseases, regimen, and surgical therapy—which were of considerable concern to the early Byzantine writers, were not maintained, much less built upon. Did the rôle of the learned physician change so much in a thousand years that he had no need for accurate diagnosis or productive therapy? Could the physician have been as successful with only his drug therapy as others had earlier been with their surgical techniques and scraping? Were the surgical techniques perhaps not as widespread or as effective (sepsis being a major but unrecognized problem) in Roman and Hellenistic medical practice as one might be led to think on the basis of the medical texts? Was the warning given by Aëtius against what he considered to be the harmful procedure of scraping trachomatous eyelids singled out and followed by the late Byzantine physicians even though Paul and others completely ignored the advice? Was the incidence of trachoma and pterygium much less in Constantinople than it had been earlier in Alexandria or even southern Europe?

With regard to the problem of whether or not Hellenistic and Byzantine physicians knew of tra-

¹⁰⁷ Actuarius does not discuss the surgical treatment of these conditions, although he does give pertinent compound remedies in the last section of his therapeutic manual. The latter has not yet been printed in the original Greek, but is at the moment available only in the sixteenth-century Latin translation made by Corneille Henri Mathys, published first in 1554 under the title *Methodi medendi libri sex* and reprinted many times, including as a part of *Medicae artis principes post Hippocratem et Galenum* (n.p., 1567).

chomatous pannus, we are again reminded of the fact that we are working with a very limited sampling of all that must have been written on the topic. We cannot rule out, particularly given the assurance of Ḥunayn ibn Isḥāq that there was a Greek term for pannus, that some Greek physician did identify the disease and possibly even tried to remove it surgically. While we cannot argue from the silence of the extant texts that the condition was unknown to Hellenistic and Byzantine physicians, we can nonetheless confidently assert that it was not at all widely known. The treatises we do possess were written by highly placed physicians, many of them court physicians or physicians-in-ordinary to emperors. One would assume that they were in a position to acquire the best texts available in their day, and to meet the most experienced practitioners. Yet they are silent on the subject. Although the topic has not been exhausted, the Byzantine texts, in regard to these three conditions, reflect no influence from Islamic physicians, whose knowledge, speculation, and treatment of them, from the tenth through the fifteenth centuries, show much evolving and development over that found in the earlier writings of Galen, Aëtius, Alexander and Paul.

It is often said that late Byzantine medicine is highly derivative, but what is apparent from this sampling is that it is not derivative enough—for if writers were simply repeating, reorganizing, and preserving earlier writings, then there would still be accounts of the causes and relationships of dis-

eases, regimen, and surgical therapy, for all of these aspects were well covered in the early Byzantine compilations. Three of the four early Byzantine encyclopedists whose works form the basis of the later knowledge included surgical practices in their reference works. Only Alexander of Tralles omitted surgery. Yet the tradition was broken, for reasons now unknown or little understood. Surgery was not of much concern to the later authors of medical tracts and appears to be left to another segment of society. There are no suggestions of new materials with which to scrape trachomatous eyelids, which one would expect if the practice were being continued, and which indeed one does find in the contemporaneous Islamic writings. When there is any reference to surgery, there are no apparent refinements in techniques—no preferences as to the number and position of hooks or the use of probes or couching needles, as one finds in the Islamic writings of the same period.

While later Byzantine writers may have been uncritical of earlier medical writers, they were not sufficiently in awe of them to make a really concerted effort to transmit accurately and fully all they said. In fact their own lack of interest in topics dictated their selection and, even more to the point, their omission of material from earlier writers.

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